risk factors of progression of pre-existing CVD. In addition, incidence and progression of venous symptoms were documented.

Methods: From May 2007 to September 2008, we contacted all participants of BVS I and invited them for a reinvestigation. The participants answered a standardized questionnaire and were examined by clinical means and by duplex ultrasound in the same way as in BVS I.

Results: The response at follow up after 6.6 years was 84.6%. We reinvestigated 1978 participants. The prevalence for varicose veins (VV) rose from 22.7% to 25.1% and for CVD from 14.5% to 16%. Participants with C-Class C2 as a maximum at BVS I increased to higher C-classes in 19.8% (nonsaphenous VV) and in 31.8% (saphenous VV). In a multivariate analysis, the main risk factors for were age, obesity, and arterial hypertension.

Conclusions: These results show a high incidence of progression of CVD to higher C-classes.

Effect of Compression Therapy on Leg Veins Anatomy: Quantification by 3D Vectorial Modeling from MRI Slices

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Background: Direct mechanical compression of the veins seems to be the main mechanism of action of compression therapy in chronic venous disease. New imaging techniques allow for a quantitative evaluation of the biophysical impact of compression on the 3D anatomy of the leg, particularly on the venous system.

Objective: To use 3D modeling and volume quantification in order to better understand the anatomical effects of compression therapy on the venous system.

Methods: A total of 15 individuals were studied by T2-weighted magnetic resonance image of the calf or thigh in different body positions (supine, prone, upright) before and after application of different stockings and bandages. In every case, the interface pressure was measured by the use of a Picopress pressure transducer. Compression devices producing different pressures and stiffness were assessed. Three-dimensional vectorial models were built with Winsurf software from cross-sectional pictures by manual segmentation of all important anatomical structures (bone, muscles, skin, superficial and deep veins). A realistic interactive 3D vectorial model of the extremity was obtained for each leg, showing the influence of compression on the leg's anatomy not only in a single cross-sectional slice but for the whole calf.

Results: Even low external pressure is able to induce deformations of the underlying muscle compartments. These shifts of tissue go along with changes of venous caliber and are sometimes unrelated to the balance between intravenous pressure and external compression on the skin. Discrepant findings concerning the narrowing of superficial and deep veins are obtained depending on the body position.

Conclusions: Three-dimensional modeling renders clear graphic images of segments of the lower extremity, demonstrating the effect of different kinds of compression on the configuration of the underlying tissue structures, including superficial and deep veins.

Compression Therapy in Mixed Ulcers: Search for a Safe Pressure Range not Affecting Arterial Inflow

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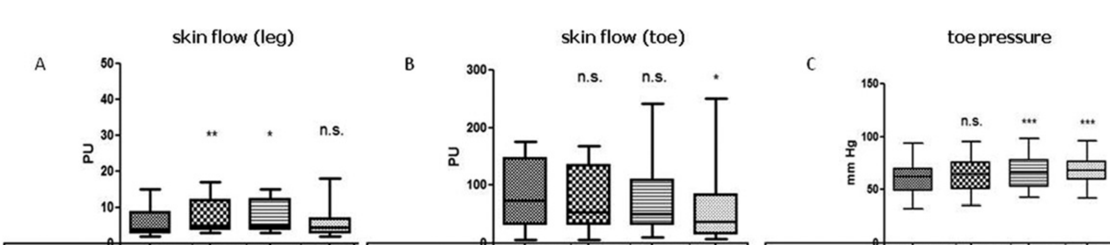
Background: About 15% to 20% of patients with venous leg ulcers have a reduced ankle brachial pressure index (ABPI) causing retarded healing. Compression is able to improve venous hemodynamics in mixed ulcers but needs to be applied with caution in order not to reduce arterial inflow. This study aimed to define a safe range of compression pressure that does not impede arterial flow.

Methods: In 25 patients with mixed ulcers (ten males, 15 females aged 76.4 ± 10 years), presenting with a mean ABPI of 0.57 ± 0.09 mm Hg and a systolic ankle pressure of 91.8 ± 18.3 mm Hg, skin flow was assessed in the peri-wound area and in the plantar surface of the first toe by means of laser Doppler flowmetry, and toe pressure was measured simultaneously. The measurements were carried out in baseline conditions and after inelastic bandage from the base of the toes to the popliteal area, applied with different pressure ranges of 20 to 30, 30 to 40 and 40 to 50 mm Hg. The pressure exerted by the bandage was continuously measured by a pneumatic device with its flat probe placed next to the laser Doppler probe. The flat, peri-wound laser Doppler probe remained under the bandage, whereas the toe probes were placed distally to the bandage.

Results: Compared with baseline conditions, skin perfusion increases significantly with a bandage pressure of 20 to 30 and 30 to 40 mm Hg, and returns to the baseline level with 40 to 50 mm Hg (Fig 1A). Toe perfusion shows a minor, not significant, decrease with 20 to 30 and 30 to 40 mm Hg, but a significant reduction with 40 to 50 mm Hg (Fig 1B). Toe pressure increases with every pressure step, showing significant differences compared with baseline with 30 to 40 and 40 to 50 mm Hg (Fig 1C).

Conclusions: External compression of 20 to 30 or 30 to 40 mm Hg increases the arterial flow, even in patients with very low ABPI and does not affect the toe pressure as long the individual systolic ankle pressure is not exceeded. Absolute ankle pressure values are more reliable than ABPI to assess the individual risk concerning compression pressure.



	baseline	20-30	30-40	40-50
Minimum	2.000	3.000	3.000	2.000
25% Percentile	3.000	4.000	4.000	3.000
Median	4.000	5.000	5.000	4.500
75% Percentile	8.750	12.00	12.25	7.000
Maximum	15.00	17.00	15.00	18.00

	baseline	20-30	30-40	40-50
Minimum	6.000	6.000	10.00	7.000
25% Percentile	32.50	33.50	33.00	17.00
Median	73.00	54.50	51.00	37.50
75% Percentile	147.8	134.8	109.3	84.00
Maximum	175.0	168.0	241.0	250.0

	baseline	20-30	30-40	40-50
Minimum	32.00	35.00	43.00	42.00
25% Percentile	49.00	50.00	52.25	59.00
Median	62.00	64.50	66.00	68.50
75% Percentile	70.00	75.50	78.00	76.25
Maximum	94.00	95.00	98.00	96.00

Venous Lymphedema

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Background: Lymphatic dysfunction found in swollen limbs with chronic venous disease (CVD), including iliac venous outflow obstruction (venous lymphedema), is often mistaken for primary lymphedema because of an inability to differentiate the etiology by present investigations. The diagnosis of primary lymphedema is often based solely on clinical features, as radioisotope lymphangiogram may be abnormal in both types.

Methods: Radioisotope lymphangiography was performed in 1608 limbs in 819 of 1658 patients with symptoms of CVD over a 13-year period, which underwent intravascular ultrasound-diagnosed/guided iliac vein stenting for iliac venous outflow obstruction. Patients with leg swelling and normal or abnormal lymphangiography were assessed clinically and compared postoperatively in regards to swelling (grade 0-3) and quality of life (CIVIQ score, 20-100).

Results: Lymphangiography was abnormal in 251 limbs in 201 patients (25%), bilateral in 25 of 201 patients (12%); no node visualization in 48 of 251 (19%) limbs and delayed visualization/reduced flow in 203 (81%) limbs. Abnormal lymphangiograms (AbL) occurred in 72 of 443 swollen limbs (16%; median age, 55 years [range, 19-91 years]; female/male ratio, 9/1; left/right limbs ratio, 3/2) and were compared with 240 limbs with normal lymphangiograms (NL). Median follow up was 10 months (range, 2-133 months).

Clinical features thought to be characteristic of primary lymphedema (early onset, bilateral involvement, swelling of dorsum of foot, squaring of toes, stemmer's sign) were present in some limbs of both groups. After iliac vein stenting, grade of swelling improved significantly in both groups AbL and NL (median, 3 [range, 1-3] to 2 [range, 0-3], and 3 [range, 1-3] to 1 [range, 0-3], $P < .0001$, respectively). Complete relief of swelling was found in 9 of 59 limbs (15%) and improvement ≥1 grade in 17 of 59 (29%) stented